

12331
200501

BY THE U.S. GENERAL ACCOUNTING OFFICE

Report To The Chairman, Subcommittee On Oversight And Investigations Committee On Energy And Commerce House Of Representatives

Status Of Two Department Of Transportation Air Bag Projects

This report discusses two National Highway Traffic Safety Administration air bag projects. One project is a joint effort with the General Services Administration to purchase 5,000 motorpool cars with driver-side air bag systems. The other project involves a contract with a private firm to design and produce air bag retrofit kits to be installed on the driver side of 500 state police cars. The estimated cost of these projects is about \$6.35 million.

GAO found that the Safety Administration is authorized to conduct these projects as research and development activities and to promote or encourage fleet owners to place orders for cars with air bags. GAO also found that the fleets involved in the projects will not provide statistically significant data on the effectiveness of air bag systems in reducing car accident injuries and fatalities. However, the Safety Administration expects the projects to provide useful information on the auto industry's air bag production capability; the performance, reliability, and maintainability of air bags; and whether the fleet drivers will accept air bags.



125331

529938

GAO/RCED-84-177
SEPTEMBER 10, 1984

Request for copies of GAO reports should be sent to:

**U.S. General Accounting Office
Document Handling and Information
Services Facility
P.O. Box 6015
Gaithersburg, Md. 20760**

Telephone (202) 275-6241

The first five copies of individual reports are free of charge. Additional copies of bound audit reports are \$3.25 each. Additional copies of unbound report (i.e., letter reports) and most other publications are \$1.00 each. There will be a 25% discount on all orders for 100 or more copies mailed to a single address. Sales orders must be prepaid on a cash, check, or money order basis. Check should be made out to the "Superintendent of Documents".



UNITED STATES GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548

RESOURCES, COMMUNITY,
AND ECONOMIC DEVELOPMENT
DIVISION

B-212740

The Honorable John D. Dingell
Chairman, Subcommittee on Oversight
and Investigations
Committee on Energy and Commerce
House of Representatives

Dear Mr. Chairman:

On April 18, 1983, you requested that we review two air bag projects administered by the National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT). One project is NHTSA's joint effort with the General Services Administration (GSA) to purchase 5,000 motorpool cars with driver-side air bag systems. The other project is NHTSA's contract with the Romeo-Kojyo Company, Inc., to design and produce air bag retrofit kits to be installed on the driver side of 500 state police cars. Subsequently, on December 12, 1983, you requested that we review additional information relating to the two air bag projects and other NHTSA activities.

As agreed with your office, we obtained information on the following issues:

- Whether NHTSA is legally authorized to conduct the two air bag projects as research and development activities; whether NHTSA is legally authorized to promote or encourage fleet owners to place orders for cars with air bags; and whether NHTSA's plans to promote the use of air bags would create an undue competitive advantage for the auto manufacturer that receives the contract to supply GSA with 5,000 air bag-equipped cars.
- The two projects' implementation and costs, including testing requirements.
- The procedures and time frame for monitoring the air bag-equipped cars and for obtaining valid statistical data.
- The safety of the air bag propellant and the technical and other problems that preclude the use of the air bag on the passenger side.

We performed our work at NHTSA and GSA headquarters in Washington, D.C., and Romeo-Kojyo Company, Inc., in Tempe, Arizona. We also visited Ford Motor Company, General Motors Corporation (GM), and Chrysler Corporation in Michigan to obtain auto manufacturers' views on NHTSA's two air bag projects, including technical issues regarding air bag safety. In addition, we contacted representatives of interest groups and auto safety research institutions to obtain their views on the air bag projects. Appendix I provides details on our objectives, scope, and methodology.

INTRODUCTION

The National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966 provided for a national safety program to reduce motor vehicle accidents, injuries, and fatalities. Provisions of these laws authorize the Secretary of Transportation to conduct highway safety research, development, and demonstration activities. Responsibility for these activities has been delegated by the Secretary to the NHTSA Administrator.

To carry out this responsibility, NHTSA established the Office of the Associate Administrator for Research and Development. This Office administers programs involving motor vehicle research, highway safety research, and related data collection, analysis, and dissemination. Funding for the two air bag projects we reviewed comes under NHTSA's motor vehicle research program. Funding for this program was about \$10.35 million in fiscal year 1983 and about \$12.25 million in fiscal year 1984; NHTSA has requested about \$15.5 million for fiscal year 1985.

As of May 1984, NHTSA had spent about \$700,000 for the state police retrofit project in fiscal year 1983 and planned to spend about \$400,000 in fiscal year 1984 for a total of about \$1.1 million. NHTSA plans to fund the NHTSA-GSA project with about \$1 million from fiscal year 1984 funds and \$4.25 million from fiscal year 1985 funds for a total of \$5.25 million.

Air bag systems are designed to deploy within a few hundredths of a second after the start of a serious car crash to protect the occupant's head and chest. An air bag system consists of devices that sense a crash above approximately 12 miles an hour and activate a gas generator which rapidly fills a bag to cushion the occupant against the crash. Appendix II provides an illustration of an air bag system.

The air bag systems to be installed in the GSA and state police fleets will consist of an air bag module in the steering wheel of the cars containing the inflator and bag, sensors, and wirings to connect the sensors to the air bag module and to a diagnostic module (light) that indicates air bag readiness. In addition, a knee bolster (padding) will be installed under the car's instrument panel to help prevent the driver from sliding

under the steering column and to distribute impact forces in an accident. The cars in the two project fleets will also contain standard lap and shoulder belts.

DOT has developed standards for occupant crash protection systems such as seat belts and air bags which are contained in Federal Motor Vehicle Safety Standard No. 208 (FMVSS 208), Occupant Crash Protection. Appendix III provides a chronology and status of DOT's Occupant Crash Protection standard.

NHTSA HAS THE LEGAL AUTHORITY TO CARRY OUT THE PROJECTS AND TO PROMOTE THE USE OF AIR BAGS

NHTSA is authorized to conduct its air bag projects as research and development activities and to promote or encourage fleet owners to place orders for cars with air bags. Also, NHTSA's plans to promote the use of air bags do not appear to create an undue competitive advantage for the auto manufacturer that will supply the air bag-equipped GSA fleet cars.

The Secretary of Transportation has broad authority to conduct research, development, and demonstration programs concerning highway safety. Section 106 of the National Traffic and Motor Vehicle Safety Act of 1966, as amended, 15 U.S.C. 1395, directs the Secretary of Transportation to conduct research, testing, development, and training, including:

"(1) collecting data from any source for the purpose of determining the relationship between motor vehicle equipment performance characteristics and (A) accidents involving motor vehicles, and (B) the occurrence of death, or personal injury resulting from such accidents; [and]

"(2) procuring (by negotiation or otherwise) experimental and other motor vehicles or motor vehicle equipment for research and testing purposes . . ." 15 U.S.C. 1395(a)(1),(2) (emphasis added).

Section 101 of the Highway Safety Act of 1966, as amended, 23 U.S.C. 403, authorizes the Secretary of Transportation to use appropriated funds to carry out safety research and for:

"(1) training or education of highway safety personnel, (2) research fellowships in highway safety, (3) development of improved accident investigation Procedures, (4) emergency service plans, (5) demonstration projects, and (6) related activities which the Secretary deems will promote the purposes of this section." 23 U.S.C. 403.

These statutes do not further define research, development, or demonstration as used therein. However, section 106's legislative history indicates that development of vehicles or vehicle components was contemplated:

"In particular, the bill authorizes the Secretary to develop, through grant or contract, experimental safety vehicles in limited but sufficient quantities to serve as demonstrations for the testing and development of safety features applicable to commercially manufactured motor vehicles." (S. Rep. No. 1301, 89th Cong., 2d Sess., reprinted in 1966 U.S. Code Cong. & Ad. News 2717-18)

NHTSA's Associate Administrator for Research and Development told us that both air bag projects are consistent with research and development because they develop technology not readily available to the public. He said that the NHTSA-GSA project will generate information to be used to evaluate air bag technology in compact cars. He also said the state police retrofit project will provide data to determine the feasibility of retrofitting cars with air bags.

Well established principles of statutory construction (Udall v. Tallman, 380 U.S. 1 (1964)), provide that an agency's interpretation of a statute it is charged with implementing is entitled to deference and should be upheld unless irrational, arbitrary, or capricious. In our opinion, NHTSA's interpretation of its legislation as authorizing it to carry out the air bag projects appears reasonably consistent with the statutory mandates noted above. Consequently, we see no legal basis to challenge NHTSA's characterization of the air bag projects as research and development.

In addition, NHTSA's general authority to conduct research, development, and demonstration activities also appears to imply that NHTSA can promote or encourage fleet owners to place orders for cars with air bags. Section 106 of the National Traffic and Motor Vehicle Safety Act of 1966, as amended, (15 U.S.C. 1395(c)) provides that NHTSA should ensure that all information, use, processes, patents, and other developments resulting from its motor vehicle safety research and development will be made freely and fully available to the general public. Similarly, section 307 of title 23, United States Code, specifically authorizes NHTSA to publish the results of its highway safety research. If the two air bag projects are successful, NHTSA plans to use the information from its air bag projects to encourage fleet owners to purchase air bag-equipped cars. NHTSA's promotion plans appear consistent with these provisions and the overall purpose of the National Traffic and Motor Vehicle Safety Act of 1966 to reduce motor vehicle accidents and injuries.

While NHTSA's air bag promotional activities may provide a competitive advantage to the auto manufacturer awarded the GSA contract, such an advantage will not necessarily be "undue." When the government procures goods or services, a current or prior producer of the particular item or service sought may have an advantage. However, the government is under no requirement to

equalize the competitive advantage a firm may have due to its incumbency or other particular circumstances, unless the alleged competitive advantage is the result of preference or unfair action by the government.

Representatives of the three auto manufacturers we contacted told us that, in their view, NHTSA's air bag promotional activities would not create or encourage an undue competitive advantage for the auto manufacturer awarded the GSA contract. They said that the contract awardee would not receive an undue competitive advantage because other auto manufacturers had an opportunity to bid on the project. Also, the project's data would be made available to all interested parties.

NHTSA-GSA AIR BAG PROJECT IS IN
EARLY STAGES OF IMPLEMENTATION

The air bag-equipped cars for the NHTSA-GSA joint project will be delivered beginning October 1984. The total cost of the GSA contract for 5,000 motorpool cars equipped with air bags is about \$35 million; NHTSA's share is about \$5.25 million.

On March 10, 1983, the Administrators of NHTSA and GSA signed an interagency agreement to establish an air bag demonstration project. Under the interagency agreement, GSA would procure 5,000 compact sedans with driver-side air bags for its Interagency Motor Pool Fleet. NHTSA would fund the incremental purchase cost of the driver-side air bag systems. As agreed between NHTSA and GSA, the incremental cost would be determined by comparing the cost of similarly equipped 1984 cars with the cost of 1985 cars plus air bags.

On June 13, 1983, GSA issued a solicitation for bid for 5,000 compact sedans equipped with driver-side air bag systems. GSA sent the solicitation to manufacturers, including GM, Chrysler Corporation, and Ford Motor Company. On July 29, 1983, GSA received its sole response from Ford Motor Company.

After about seven months of negotiating over primarily the price of the cars, Ford stated on February 15, 1984, that its final offer per car was \$7,000 which included \$830 for the air bag. On February 22, 1984, GSA awarded a firm fixed price, definite-quantity contract to Ford Motor Company for \$35,030,070 for 5,000 air bag-equipped cars.

Computation of incremental cost per car

In a February 15, 1984, letter to NHTSA's Associate Administrator for Research and Development, the Director of GSA's Automotive Commodity Center stated that GSA had determined the incremental cost to NHTSA to be \$1,050 per vehicle. GSA determined the incremental cost by comparing the average price of three

1984 competitive GSA procurements of similarly equipped compact sedans with the price of the 1985 compact sedans with air bags and took relevant price adjustments into account, as shown in the following table.

GSA's Computation of Estimated Price
of 1985 Compact Sedan

Contract award date	Number of cars	Per unit		Comparison price
		Price	Adjustments	
12-20-83	639	\$5,925	-\$238 ^a	\$ 5,687
12-08-83	10,537	5,127	None	5,127
01-20-84	336	6,121	None	6,121
Average of three comparison prices				\$ 5,645
Adjustments:				
Estimated price increase for 1985 model year of 2.5 percent				141
Dealer delivery				125
Supplemental rear stoplight ^b				<u>30</u>
Estimated cost of 1985 compact sedan				\$ <u>5,941</u>

^aAdjustments for military equipment and shop manuals.

^bAdditional GSA requirement.

GSA rounded the \$5,941 to \$5,950 to obtain the base price it would pay for a 1985 compact sedan without air bags. GSA then determined that the difference between the base price of \$5,950 and the \$7,000 price for the air bag-equipped car would be the incremental cost of \$1,050. Of this amount, GSA determined that \$830 was attributable to the air bag, based on Ford's stated air bag price and that the remaining \$220 was attributable to the noncompetitive situation of the procurement, i.e., there was only one bidder.

GSA made its calculation based on a simple average approach. It should be noted that the wide variation in quantities and prices paid for the cars used in the GSA computation could argue for a weighted average approach. The Director of GSA's Automotive Center told us that GSA had made various analyses of the data from the three GSA vehicle procurements, including a simple average, a weighted average, and plotting the data logarithmically, to determine NHTSA's share of the cost of the Ford vehicles with air

bags. He said that after examining this data, plus information which indicated that the bid of \$5,127 per vehicle for the 10,537 vehicles was about \$750 lower than what GSA would normally expect to pay, GSA considered the simple average of \$5,645, plus adjustments, to be a fair and reasonable estimate for use in computing NHTSA's share of the cost to purchase vehicles with air bags.

On February 16, 1984, NHTSA's Associate Administrator for Research and Development wrote to GSA agreeing to reimburse GSA \$830 per car for cost of the air bag and \$220 per car "for the additional cost incurred by GSA as a result of the noncompetitive situation that resulted from this procurement."

The Director of GSA's Automotive Commodity Center told us it was never intended that NHTSA's reimbursement be restricted only to the price of the cars' air bags. He said that GSA recognized that any contract to purchase cars with air bags would probably be more costly due to the limited number of auto manufacturers bidding on the contract and the low volume of air bag-equipped vehicles being requested. Also, NHTSA's Associate Administrator for Research and Development told us that he believed GSA's computation of the incremental cost was consistent with the interagency agreement and was reasonable.

Testing the air bag system

Ford is required to test its air bag system prior to delivering the air bag-equipped cars to GSA. The performance of the air bag system on a driver-seated test dummy restrained with a lap and shoulder belt is to be tested. According to NHTSA's Associate Administrator for Research and Development, NHTSA will evaluate the test data based on the passive restraint injury criteria specified in FMVSS 208, Occupant Crash Protection standard. These criteria specify the thresholds of head, chest, and thigh injuries that can occur for a front-seated test dummy in a crash. In addition, Ford is required to test and NHTSA will evaluate the performance of the air bag system on a test dummy without a lap and shoulder belt to ensure that the air bag system does not expose the driver to greater hazards than if the car had no air bag.

NHTSA's Associate Administrator for Research and Development told us that although the Ford air bag-equipped cars will be evaluated based on the passive restraint injury criteria to provide performance data, the cars will have to meet only the safety belt requirement of FMVSS 208. He said that, under FMVSS 208, cars equipped with manual safety belts have to comply with a series of requirements for strength, durability, and fit; and cars equipped with only passive restraints such as air bags have to satisfy the standard's passive restraint injury criteria. He said that, however, cars equipped with both manual safety belts and an air bag can comply with FMVSS 208 by meeting either the manual or passive restraint requirements. He told us that Ford's air bag-equipped

cars will not be required to meet the passive restraint requirements of the standard because NHTSA considers the air bag system to be supplemental to the manual lap and shoulder belt system.

STATUS OF NHTSA'S AIR BAG RETROFIT
PROJECT FOR STATE POLICE FLEETS

The air bag retrofit kits for NHTSA's state police retrofit projects were installed in the police cars beginning in December 1983, and NHTSA expects all 500 kits to be installed by September 1984. The kits are installed as the new cars are prepared for service to replace older cars which have reached the end of their service life. NHTSA's cost for the project is about \$1.1 million.

In November 1982, the Administrator of NHTSA announced plans to install driver-side air bags in state police fleet cars to determine the feasibility of retrofitting air bags into fleet cars. On November 1, 1982, NHTSA issued a solicitation for bids to design, fabricate, and evaluate a retrofit air bag system suitable for police car fleets. NHTSA received two bids on the solicitation and on April 15, 1983, awarded a cost-plus-fixed-fee contract to Romeo-Kojyo Co., Inc. in Tempe, Arizona, because it was the lowest bidder.

The air bag retrofit kits are to be installed in six state police fleets. These fleets are from Arizona, California, Maryland, Mississippi, Ohio, and Wisconsin. NHTSA selected these state police fleets because (1) each would have cars of the make and model for which the retrofit kits would be designed, i.e., Dodge Diplomats, Plymouth Grand Furys, and Ford LTD Crown Victorias; (2) each would have at least 100 of these types of cars; and (3) the police officers are required to wear seat belts.

Retrofit project costs

As of May 1984, NHTSA's contract cost with Romeo-Kojyo Co., Inc. was \$850,114. In addition, NHTSA's contract technical manager for the retrofit project estimated that NHTSA incurred \$254,444 in costs to test the air bag retrofit kits for a total project cost of about \$1.1 million as shown in the following table.

NHTSA's Romeo-Kojyo contract costs:

Initial design, fabrication, testing, and first 100 kits	\$457,955	
Amendment to contract for 400 additional kits and knee bolsters for all the cars, which were determined to be needed after initial testing was conducted	329,202	
Amendment to contract for additional training and spare parts	<u>62,957</u>	\$ 850,114
NHTSA's estimated testing costs:		<u>254,444</u>
Total		<u>\$1,104,558</u>

If the cost of \$1.1 million were apportioned to each retrofitted car (500) the potential cost per car would be over \$2,000. However, to apportion these costs would be misleading because design, fabrication, and testing costs are a one-time expense which increases the cost of initial kits. Also, the cost of the air bag kits is highly dependent on production volume--the lower the volume, the higher the cost. For example, NHTSA was able to amend the contract for 400 more air bag kits at an average cost of about \$800 per kit, including the knee bolster.

Testing the air bag retrofit system

From September 1983 to January 1984, NHTSA tested the air bag retrofit system in 35 car and sled (i.e., a mockup of a car) crash tests to determine the air bag performance. NHTSA used the head, chest, and thigh injury criteria specified in FMVSS 208, Occupant Crash Protection standard to evaluate the air bag retrofit system performance. The test results for the 35 car and sled crash tests using various restraint situations are included in appendix IV. Our review of the test results shows that a majority of the tests were successful.

PROJECTS WILL PROVIDE LIMITED,
BUT USEFUL, DATA

NHTSA's two air bag projects will not provide statistically significant data on the effectiveness of air bags in reducing car accident injuries and fatalities. This was noted during congressional review of NHTSA's fiscal year 1984 appropriation. However, NHTSA expects the projects to provide useful information on the auto industry's air bag production capability; the performance, reliability, and maintainability of air bags; and whether the fleet drivers will accept air bags.

NHTSA will be collecting various accident data from the GSA and retrofit state police fleets with air bags. Specifically, the data will include information on vehicle damage, occupant injury, occupant motion or contact points within the vehicle, estimated impact speed, and whether the air bag performed as expected.

The accident data will be collected by five accident investigation teams which are currently under contract to NHTSA to investigate accidents involving air bag-equipped cars. Two of the teams are from Calspan Field Services, Inc., in Buffalo, New York. The remaining three are from University of Michigan's Transportation Research Institute in Ann Arbor, Michigan; University of Tennessee's Transportation Center in Knoxville, Tennessee; and Dynamic Science, Inc., in Downey, California. Each team consists of at least two persons having medical and technical expertise. When NHTSA notifies them of accidents involving cars with air bags, they perform in-depth investigations.

NHTSA's National Center for Statistics and Analysis, Office of Research and Development, will monitor and analyze the accident data. This Center is responsible for obtaining and evaluating nationally representative data related to traffic and motor vehicle safety in support of federal, state, and local highway safety programs. The Center has been monitoring and analyzing data collected from previous air bag field experiences on a case-by-case basis and has plans to monitor and analyze the data from the GSA and state police fleets. The Center plans to monitor the GSA fleet for about 6 years and the state police fleet for about 2 years from the time the air bags are installed. This covers the periods that such cars are normally in service. According to NHTSA's Director of the National Center for Statistics and Analysis, costs related to the data collection, monitoring, and analysis will be minimal because of the few air bag deployments anticipated.

A planning document obtained from the National Center for Statistics and Analysis shows that the fleet sizes of 5,000 for the GSA fleet and 500 for the state police fleet are too small to provide data that will be statistically meaningful. The planning document shows that a fleet providing at least 400,000 vehicle years of experience would be needed to estimate air bag effectiveness accurately.

Furthermore, the operations and driving experiences of the GSA and state police fleets are different from those of the general public. For example, GSA drivers and drivers in four of the six state police departments in the retrofit project are required to wear lap and shoulder belts. Arizona and California state police have the option of wearing either the lap or lap and shoulder belts. On the other hand, the general public is not required to wear seat belts, and NHTSA's most current data show that general

public seat belt usage for front seat occupants is slightly above 12 percent.

Although the Chief of GSA's Motorpool Branch told us that GSA does not know at this time what agencies will use the air bag-equipped cars because the cars will be given on an as-needed basis, the Director of GSA's National Automotive Center told us that the operations and driving experiences of GSA drivers are generally different from the general public's because:

- The cars are generally driven during the day and will not be exposed to evening driving conditions.
- The drivers are government employees on duty whose jobs depend on good driving records.
- The driver population does not normally include "young males" who are statistically overrepresented in accidents.

In addition, according to an Ohio State police official, state police officers are exposed to more hazardous conditions such as driving at high speed and in all types of weather than the normal driver. Officials of the other five state police departments made similar statements.

During congressional review of NHTSA's fiscal year 1984 appropriations, the House Committee on Appropriations discussed the two air bag projects. Its report stated:

"The Committee is aware that a substantially larger test fleet is needed to produce meaningful field data on air bag accident performance. The Committee urges NHTSA to intensify its efforts to persuade larger fleet buyers to purchase air bag equipped vehicles in order to establish a statistically significant demonstration fleet by model year 1986." (H.R. Rep. No. 246, 98th Cong., 1st Sess. 54.)

NHTSA's Director of the National Center for Statistics and Analysis and Associate Administrator for Research and Development told us that NHTSA is aware that the GSA and the state police fleets will not provide statistically significant data on the effectiveness of air bag systems in reducing car accident injuries and fatalities. They agreed that the fleets are too small to provide statistically meaningful results and that the vehicle operations and driving experiences of the GSA and state police fleets are different from those of the general public. However, they stated that NHTSA can obtain useful information from the projects such as the auto industry's air bag production capability; the performance, reliability, and maintainability of air bags; and whether fleet drivers will accept air bags. Furthermore, they stated that the main question to answer is whether the air bag system does what it is intended to do, not who had the accident.

Representatives we contacted from the auto manufacturers, Insurance Institute for Highway Safety, Center for Auto Safety, University of North Carolina Highway Safety Research Center, University of Michigan's Transportation Safety Research Institute, and Texas A & M University's Texas Transportation Institute were aware that the GSA and state police fleets would not provide statistically significant data on the effectiveness of air bags in reducing car accident injuries and fatalities. However, they told us that they agreed with NHTSA that the projects will provide some useful information on air bags. For instance, the Director of Ford's Automotive Safety Office and GM's Director of Automotive Safety Engineering said that they support the projects. They said that the projects will provide needed information on the performance of driver-side air bags in actual use.

Also, the President of the Insurance Institute for Highway Safety and the Director of the Center for Auto Safety support the projects because they enable fleet purchasers such as GSA and the state police to buy air bags that would otherwise not be available, keep air bag technology and expertise alive, and demonstrate the usefulness of air bags. Furthermore, the Associate Research Psychologist at the Texas Transportation Institute told us that the more data collected on air bags, the more inferences can be made on the fatality- and injury-reducing effectiveness of air bags even though statistically significant data have not been obtained.

On the other hand, while Chrysler's Director of Federal Government Affairs agreed that the projects will provide some useful data on air bag reliability and maintainability, he did not support the projects. He said that NHTSA should be encouraging mandatory seat belt use laws because there are uncertainties of public acceptability, performance, and cost-effectiveness with automatic restraints such as air bags.

NHTSA IS AWARE OF TECHNICAL ISSUES
REGARDING AIR BAG DISPOSAL AND
DESIGN OF PASSENGER-SIDE AIR BAGS

NHTSA, in its two projects, is addressing the concerns that relate to the safe disposal of cars with undeployed air bags. However, other concerns relating to designing a safe air bag system for the passenger side are not being addressed in the two projects.

In recent testimony on December 5, 1983, as part of NHTSA's rulemaking effort on the need for passive restraint requirements in vehicles, the Executive Director of the Institute of Scrap Iron and Steel, Inc., expressed concerns regarding the disposal of vehicles with undeployed air bag systems. He stated that these concerns focus on (1) the danger of fire and explosion when sodium azide, the chemical used as the air bag propellant, is crushed

with certain metals such as lead and copper and (2) the unknown health hazards related to the possible exposure of sodium azide to water and air, including the possible exposure of individuals to sodium azide when canisters containing sodium azide are crushed.

Sodium azide pellets are placed in a sealed container as part of the inflator in the air bag steering wheel module. When the sodium azide is ignited by an electrical charge reaction, it produces an almost pure nitrogen product that inflates the air bag. However, when the sodium azide is unspent, as in the case of an undeployed air bag, and comes into contact with heavy metals such as copper or lead during the vehicle scrapping process, it can explode. In addition, sodium azide has been shown to be a mutagen¹ in plant life, bacteria, and animal cells and may be a carcinogen (cancer-causing agent) because most mutagens are also carcinogens.²

NHTSA is addressing problems regarding the safe disposal of cars with undeployed air bags. NHTSA's Associate Administrator for Research and Development told us that NHTSA realizes that there may be potential problems if proper actions are not taken when vehicles equipped with undeployed air bags are scrapped. He said that NHTSA has initiated the process for resolving the disposal problems. On April 26, 1984, NHTSA met with representatives from GSA, Ford, and the auto scrap processing industry to discuss and establish a plan for disposing of cars with undeployed air bags containing unspent sodium azide. The Associate Administrator said that this was the first of several meetings to be held on the disposal issues and that NHTSA expects to have a comprehensive disposal plan for its two air bag projects by early 1985.

In addition, there are concerns regarding the design of a safe air bag system for the passenger side. Ford's Director of the Automotive Safety Office, GM's Director of Automotive Safety Engineering, and Chrysler's Director of Federal Government Affairs expressed concern that an out-of-position front occupant on the passenger side may be injured by the force of a deploying air bag. According to GM's Director of Automotive Safety Engineering, the out-of-position problem is especially associated with a small child on the passenger side.

NHTSA's Associate Administrator for Research and Development told us that NHTSA is aware of problems with installing air bags on the passenger side where the passenger may be out of

¹Substance that tends to cause hereditary changes in an organism.

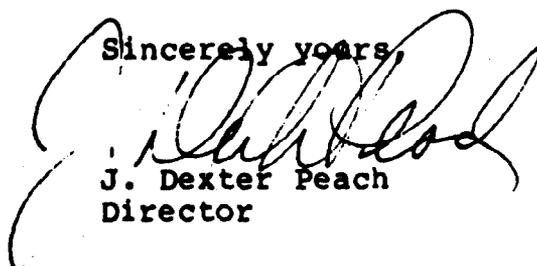
²In a report entitled Passive Restraints For Automobile Occupants--A Closer Look (CED-79-93, July 27, 1979), we presented these potential health and safety problems posed by sodium azide air bag systems.

position, but is not addressing it in its two air bag projects. He said that the projects involve only driver-side air bags. He said that NHTSA's justification for installing only driver-side air bags is that they are less costly than installing air bags on both sides and that over half of the vehicle accident fatalities are drivers.

- - - - -

As requested by your office, we did not obtain DOT comments on this report. However, we discussed the report's contents with NHTSA's Administrator, Chief Counsel, and Associate Administrator for Research and Development. Also, as arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of the report until 30 days from the date of this report.

Sincerely yours,



J. Dexter Peach
Director

C o n t e n t s

		<u>Page</u>
APPENDIX		
I	OBJECTIVES, SCOPE, AND METHODOLOGY	1
II	ILLUSTRATION OF AIR BAG RESTRAINT SYSTEM	3
III	CHRONOLOGY AND STATUS OF DOT'S OCCUPANT CRASH PROTECTION STANDARD	4
IV	RETROFIT AIR BAG CRASH TEST RESULTS	9

OBJECTIVES, SCOPE, AND METHODOLOGY

As requested by the Chairman of the Subcommittee on Oversight and Investigations, House Committee on Energy and Commerce, we reviewed two NHTSA air bag projects--the interagency agreement with the GSA to purchase 5,000 motorpool cars with driver-side air bag systems and the contract with Romeo-Kojyo Company, Inc., for the design and production of air bag retrofit kits to be installed on the driver side of 500 state police cars. Our review covered the period November 1982 through May 1984. Specifically, we obtained information on:

- Whether NHTSA is legally authorized to conduct the two air bag projects as research and development activities, whether NHTSA is legally authorized to promote or encourage fleet owners to place orders for cars with air bags, and whether NHTSA's plans to promote the use of air bags would create an undue competitive advantage for the GSA contract awardee.
- The projects' implementation and costs, including the contract awarded by GSA to purchase cars with air bags and the contract awarded by NHTSA to retrofit state police cars with air bags, and testing requirements.
- The procedures and time frame for monitoring the air bag-equipped cars and for obtaining valid statistical data.
- The safety of the air bag propellant and the technical and other problems that preclude the use of the air bag on the passenger side.

We examined NHTSA's authorizing legislation and related legislative history to determine (1) NHTSA's authority to conduct the NHTSA-GSA and retrofit projects as research and development activities, (2) whether NHTSA can promote or encourage fleet owners to place orders for cars with air bags, and (3) whether NHTSA's plans to promote the use of air bags would create an undue competitive advantage for the GSA contract awardee. We discussed these issues with NHTSA's Associate Administrator for Research and Development, GSA's Director of the National Automotive Center, Ford's Director of the Automotive Safety Office, GM's Director of Automotive Safety Engineering, and Chrysler's Director of Federal Government Affairs.

We reviewed NHTSA's air bag projects' planning documents and related procurement, contracts, and information to determine the projects' implementation status, costs, and testing requirements. This included a review of GSA's contract with Ford Motor Company to purchase 5,000 cars with air bags; GSA's pricing evaluation of the contract; and NHTSA's contract with Romeo-Kojyo Company, Inc., for the design and production of air bag retrofit kits to be installed on the driver side of 500 state police cars. We also discussed the projects' status with the project managers at NHTSA; GSA's Director of National Automotive Center; Ford's Director of

the Automotive Safety Office; President of Romeo-Kojoyo Company, Inc.; and police officers of the six state police departments-- Arizona, California, Maryland, Mississippi, Ohio, and Wisconsin-- participating in the retrofit project.

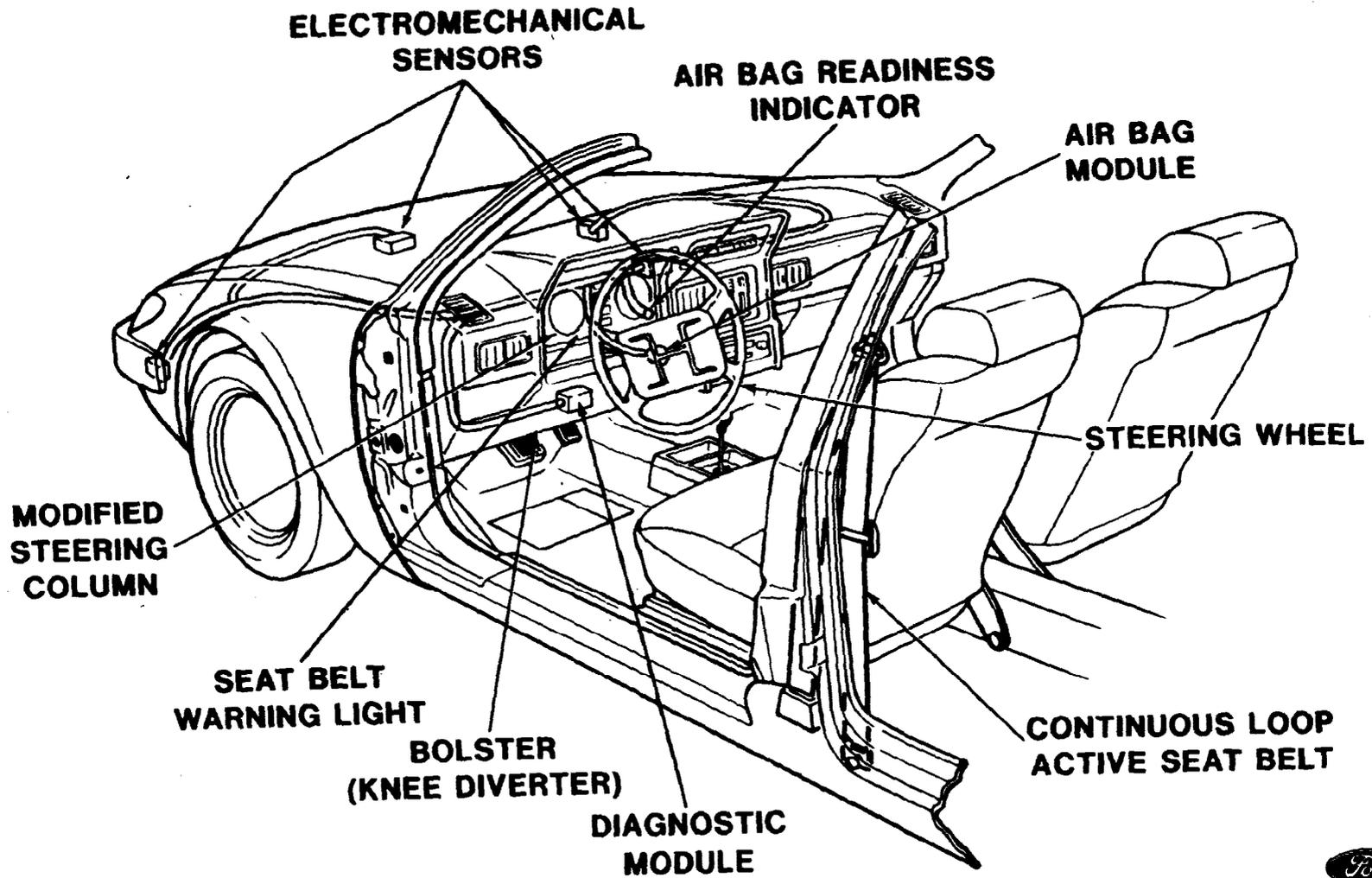
We discussed the data that will be obtained from the two air bag projects and the time frame for monitoring the air bag-equipped cars with NHTSA's Director of the National Center for Statistics and Analysis. We also obtained views on the usefulness and worthiness of the projects from auto manufacturers, interest groups, and auto safety research institutions. The individuals included Ford's Director of the Automotive Safety Office, GM's Director of Automotive Safety Engineering, Chrysler's Director of Federal Government Affairs, President of the Insurance Institute for Highway Safety, Executive Director of the Center for Auto Safety, Director of the University of North Carolina's Highway Safety Research Center, a research scientist at the University of Michigan's Transportation Safety Research Institute, and an associate research psychologist at Texas A & M University's Texas Transportation Institute.

We discussed the safety of the air bag propellant sodium azide and technical and other problems that preclude the use of the air bag on the passenger side with NHTSA's Associate Administrator for Research and Development; Ford's Director of the Automotive Safety Office; GM's Director of Automotive Safety Engineering; Chrysler's Director of Federal Government Affairs; and Director of the Institute of Scrap Iron and Steel, Inc.

During our review, we did not perform technical analyses of air bag effectiveness or testing criteria and procedures, nor did we verify air bag costs. Our review was focused on the type of information the NHTSA-GSA and state police retrofit projects will provide. We relied on our discussions with motor vehicle safety experts in the federal government and from the private sector to obtain insight into the adequacy of DOT's two air bag projects. We also did not perform technical analyses of problems associated with the use of air bags on the passenger side since our review focused on NHTSA's two air bag projects, which involve only driver-side air bags. Furthermore, as requested by the Subcommittee Chairman, we did not obtain formal agency comments.

Except as noted above, we made this review in accordance with generally accepted government auditing standards.

AIR BAG RESTRAINT SYSTEM



CHRONOLOGY AND STATUS OF DOT'SOCCUPANT CRASH PROTECTION STANDARD

When worn, safety belts are recognized as being highly effective in preventing occupants in the event of a crash from contacting parts of the vehicle interior and from being thrown from the vehicle. On February 3, 1967, DOT issued Federal Motor Vehicle Safety Standard 208 to require the installation of lap and shoulder belt assemblies at front outboard¹ seating positions (except convertibles) and lap belt assemblies at all other designated seating positions. That standard became effective January 1, 1968.

By July 1969, however, DOT had concluded that safety belt usage was too low to reduce traffic injuries to an acceptable level. Accordingly, on July 2, 1969, DOT issued a notice of proposed rulemaking to consider "the prompt development and installation of passive restraint systems." These systems were defined as protective systems that require no voluntary action by vehicle occupants. This 1969 notice, entitled "Inflatable Occupant Restraint Systems," anticipated that inflatable cushions (or air bags) would provide protection in frontal collisions for those occupants who had not fastened their safety belts.

In July 1971, DOT observed that "some belt-based concepts have been advanced that appeared to be capable of meeting the complete passive protection options," leading it to add a new section to the standard "to deal expressly with passive belts," 36 Fed. Reg. 12858 (July 8, 1971).

The 1972 passive restraint version of the standard called for "complete passive protection" on vehicles manufactured after August 15, 1975. Meanwhile, motor vehicles built between August 1973 and August 1975 were to carry either passive restraints or lap and shoulder belts coupled with an "ignition interlock" that would prevent starting the vehicle if the belts were not connected. Most vehicle manufacturers chose the second option.

But, by late 1974, the public's irritation regarding not being able to start their cars without fastening safety belts influenced the Congress to reject the entire standard. The Motor Vehicle and Schoolbus Safety Amendments of 1974 (15 U.S.C. 1410b) contained two sections that affected safety belts. First, section 1410b(b)(1) of the 1974 amendments banned any motor vehicle safety standard requiring ignition interlocks or continuous buzzers to warn that safety belts were not in use. Second, section 1410b(b)(2) and (3) of the amendments provided that if a modified standard could only be satisfied by any system other than safety belts, the amended safety standard would have to be submitted to the Congress where it might be vetoed by a concurrent resolution of both Houses.

¹Excludes the center seating position.

After other revisions and postponements during 1975 and 1976, DOT issued on July 5, 1977, a new mandatory passive restraint regulation, 42 C.F.R. 571.208 (1977), that ordered a "phasing in" of passive restraints based on vehicle size, beginning with large cars manufactured beginning September 1, 1981 (1982 models), mid-size cars manufactured beginning September 1, 1982 (1983 models), and small cars manufactured after September 1, 1983 (1984 models). Although the 1977 regulation withstood tests in the Congress and the courts, in February 1981, the Secretary of Transportation reopened the rulemaking process in part because "economic circumstances have changed since the standard was adopted in 1977" and because of the "difficulties of the automobile industry," citing high unemployment, sales "at a very depressed level," and losses "by even the largest of the domestic manufacturers."

On April 9, 1981, DOT ordered a 1-year delay in applying the regulation to large cars, extending the deadline to September 1, 1982. On the same day, NHTSA proposed the possible rescission of the regulation and on October 29, 1981, issued a final rule (Notice 25), 46 Fed. Reg. 53,419, that rescinded the passive restraint requirement and amended Standard 208 to eliminate the requirement.

In the October 1981 rule, DOT stated that before starting the rulemaking in February 1981, it had decided to undertake a major educational effort to enhance voluntary safety belt usage. According to DOT, these efforts would address not only those users/purchasers amenable to change that would have been affected by the 1977 passive restraint rule, but also those currently riding and driving in motor vehicles then on the road. DOT stated that the potential for immediate impact from its planned educational effort was therefore many times greater. DOT added that with the much greater number of persons directly affected, educational efforts would need to raise safety belt usage in the vehicles on the road during the 1980s by only a few percentage points to achieve far greater safety benefits than the passive restraint requirements could have achieved during the same period.

As part of its October 1981 rescission notice, NHTSA concluded that the passive restraints required by Standard 208, as modified in 1977, could not be justified due to the high costs and the uncertainty of the magnitude, if any, of its safety benefits. The standard could have been satisfied by air bags or by either of two kinds of passive safety belts--"continuous" and "detachable." Both types of passive safety belts provide the emergency release mechanism required by the standard. On the continuous belts, this mechanism could consist of a "spool-out" device that expands the belt, but does not detach it. On the detachable belts, the mechanism allows separation of the belt in the same way that manual safety belts are buckled and unbuckled.

In its rescission notice, NHTSA found that it was "reasonably certain" that if the 1977 rule were implemented, "the overwhelming majority of new cars would be equipped with automatic belts that

are detachable." NHTSA found that detachable belts were the functional equivalent of manual belts already available in motor vehicles and therefore any increase in usage would be minimal.

State Farm Mutual Automobile Insurance Company and the National Association of Independent Insurers subsequently challenged NHTSA's rescission of the passive restraint requirement as arbitrary, capricious, an abuse of discretion, and a violation of law as defined by the Administrative Procedure Act, 5 U.S.C. 706 (1976). On June 1, 1982, the United States Court of Appeals for the District of Columbia Circuit decided that NHTSA had unlawfully rescinded the passive restraint standard as proposed in 1977. Because of the obvious difficulties created by DOT's rescinding the standard, the court in an August 4, 1982, order stayed the compliance date for large- and mid-size automobiles until September 1, 1983, the same date the standard would apply to small automobiles. Further, the court ordered that DOT had until October 1, 1982, to advise the court of whether such a compliance date was achievable or to state that a longer period was required.

On September 8, 1982, the Solicitor General, Department of Justice, on behalf of DOT, petitioned the United States Supreme Court to review the judgment and supplemental order of the court of appeals. On November 8, 1982, the Supreme Court agreed to review the appeals court ruling and order. The appeals court then canceled its August 1982 order.

On June 24, 1983, the Supreme Court held that NHTSA's rescission of the passive restraint requirement in Modified Standard 208 was arbitrary and capricious. The Court stated that "the agency failed to present an adequate basis and explanation for rescinding the requirement and must either consider the matter further or adhere to or amend the Standard along lines which its analysis supports." The Supreme Court remanded the case to the District of Columbia Circuit Court of Appeals to remand the matter to NHTSA for further consideration.

On September 1, 1983, DOT suspended the passive restraint requirement for 1 year to ensure sufficient time for considering the issues raised by the Supreme Court's decision. DOT concluded that suspension was justified because compliance with the passive restraint requirement would have been impracticable and it would have been inappropriate to require it during the review period. In the meantime, motor vehicles must have at least lap and shoulder belt protection systems with belt warnings or have passive restraints that meet certain crash test conditions and injury criteria.

On October 19, 1983, DOT issued a Notice of Proposed Rule-making proposing several alternatives for resolving the issues raised by Standard 208 as contemplated by the Supreme Court's decision. These alternatives are:

- Retain the passive restraint requirement of Standard 208.
Under this alternative, the substantive requirement of Standard 208 would be retained. Compliance could be by all types of passive restraints, including detachable belts. A new compliance date would have to be established.
- Amend the passive restraint requirement of Standard 208.
Numerous alternatives are proposed. For example, an amendment could include provisions for an air bag-only option or an air bag or nondetachable automatic belt option. Sub-alternatives could include passive requirements for full front seat protection, outboard seating position protection, or driver-only protection. An additional alternative could be to require that cars be manufactured with an air bag retrofit capability.
- Rescind the passive restraint requirement of Standard 208.
The Department could again rescind the requirement if its analysis led it to that conclusion. The Supreme Court decision does not bar rescission after the Department considers the matter further.

In addition to the above, DOT proposed other steps in conjunction with, or as a supplement to, one or more of the alternatives. These steps are: conduct a demonstration program, seek mandatory state safety belt usage laws, and seek legislation mandating consumer option of purchasing any kind of restraint system, such as air bag, passive belt, or manual belt.

On May 14, 1984, DOT issued a supplemental notice of proposed rulemaking proposing four additional alternatives to those proposed on October 19, 1983. These are:

- A mandatory demonstration program, specifically suggested by Ford Motor Company, under which each automobile manufacturer would be required to equip 5 percent of each of its cars with automatic restraints for 4 years.
- Driver-side air bags only would be required for small cars. Under this alternative, the final rule could prescribe either manual belts or any type of automatic restraint for the other seating positions in small cars and all seating positions in all other cars.
- Automatic restraints would be required in all cars manufactured after a set date, but this requirement would be waived for vehicles sold to residents of a state which had passed a mandatory seat belt usage law, which meets certain minimum criteria.
- Automatic restraints would be required in all new cars manufactured after a set date, unless three-fourths of the states had passed mandatory belt usage laws before that date.

On July 17, 1984, the Secretary of Transportation issued a new rule requiring automatic crash protection for passenger cars manufactured for sale in the United States based on the following phase-in schedule and conditions:

- Ten percent of all automobiles manufactured after September 1, 1986.
- Twenty-five percent of all automobiles manufactured after September 1, 1987.
- Forty percent of all automobiles manufactured after September 1, 1988.
- One-hundred percent of all automobiles manufactured after September 1, 1989.
- The requirement for automatic occupant restraints will be rescinded if state mandatory seatbelt use laws meeting specified conditions are passed by a sufficient number of states before April 1, 1989, to cover two-thirds of the population of the United States.
- During the phase-in period, each passenger automobile that is manufactured with a system that provides automatic protection to the driver without automatic belts will be given an extra credit equal to one-half of an automobile toward meeting the percentage requirement.
- The front center seat of passenger cars will be exempt from the requirement for automatic occupant protection.
- Rear seats are not covered by the requirements for automatic protection.

Retrofit air bag crash test results

<u>Number</u>	<u>Test vehicle</u>	Anthropomorphic test dummy (note a)	Vehicle speed (MPH)	Occupant restraint used				Injury crash results (note b)			
				Air bag	Knee bar	Lap belt	Lap and shoulder belt	Head	Chest (G's)	Thigh load (lbs)	
									Left	Right	
1	Ford sled tests (note c)	50th	32.5	Yes	Yes	No	No	524	55.0	1,426	1,486
2		50th	32.5	Yes	Yes	No	No	489	45.5	1,253	1,393
3		50th	32.5	Yes	Yes	No	No	209	37.6	1,690	1,574
4		50th	32.5	Yes	Yes	No	Yes	510	34.8	380	427
5		50th	32.5	Yes	Yes	No	No	438	42.6	1,667	1,705
6		50th	32.5	Yes	No	No	No	263	40.2	1,248	3,002
7		50th	32.5	No	No	No	Yes	865	35.9	413	433
8		95th	32.5	Yes	Yes	No	Yes	644	41.0	448	518
9		95th	32.5	Yes	Yes	Yes	No	858	54.5	494	516
10		95th	32.5	Yes	Yes	No	No	436	54.4	1,728	2,445
11		50th	32.5	Yes	Yes	Yes	No	468	43.4	430	702
12		50th	32.5	No	No	Yes	No	2,584	44.1	242	410
13		5th	32.5	Yes	Yes	No	No	276	40.7	1,447	569
14		5th	32.5	Yes	Yes	Yes	No	234	38.6	174	182
15		50th	38.5	Yes	Yes	No	Yes	664	38.0	772	842
16		50th	38.5	Yes	Yes	No	No	768	60.8	1,816	1,826
17		50th	32.5	Yes	Yes	No	No	369	30.6	1,138	2,324
18		50th	32.5	Yes	Yes	Yes	No	692	35.4	370	288
19		50th	32.5	Yes	Yes	No	No	343	34.4	1,697	1,551
20	50th	32.5	No	No	No	No	2,401	58.8	1,992	2,754	
21	Dodge sled tests (note c)	50th	32.5	Yes	Yes	No	Yes	518	33.8	240	190
22		50th	32.5	Yes	Yes	No	No	502	51.5	1,962	1,605
23		50th	32.5	Yes	Yes	Yes	No	607	51.5	382	257
24		50th	32.5	Yes	Yes	No	No	542	57.0	1,745	1,487
25		95th	32.5	Yes	Yes	No	Yes	734	34.0	384	271
26		95th	32.5	Yes	Yes	Yes	No	1,041	54.0	498	268
27		95th	32.5	Yes	Yes	No	No	804	61.0	1,983	1,702
28		5th	32.5	Yes	Yes	No	Yes	338	38.6	112	107
29		5th	32.5	Yes	Yes	No	No	201	45.9	1,459	1,223

6

APPENDIX IV

APPENDIX IV

(Continued)

(347513)

Number	Test vehicle	Anthropomorphic test dummy (note a)	Vehicle speed (MPH)	Occupant restraint used				Injury crash results (note b)			
				Air bag	Knee bar	Lap belt	Lap and shoulder belt	Head	Chest	Thigh load	
								(G's)	(lbs)	(lbs)	
30 ^d	1982 Ford LTD car (note e)	50th	29.69	Yes	Yes	No	No	821	53.8	1,447	1,484
31	1982 Ford LTD car	50th	30.33	Yes	Yes	No	No	476	47.7	1,754	1,356
32	1981 Dodge Diplomat car	50th	29.44	Yes	Yes	No	No	991	55.0	1,557	1,427
33	1982 Ford LTD car	50th	30.06	Yes	Yes	No	No	306	29.9	1,846	2,211
34	1981 Dodge Diplomat car	50th	29.37	Yes	Yes	No	No	919	61.5	1,848	1,660
35	1981 Dodge Diplomat car	50th	29.98	Yes	Yes	No	No	991	63.0	1,661	2,354

^aThe 50th percentile anthropomorphic dummy represents the point at which 50 percent of the male population is taller and heavier and 50 percent is shorter and lighter. The 50th percentile test dummy is used to evaluate passive restraints under DOT's Occupant Crash Protection standard. The 5th percentile female test dummy represents the point at which 5 percent of the female population is shorter and lighter, and the 95th percentile male test dummy represents the point at which 5 percent of the male population is heavier and taller. These test dummies are not required under the Occupant Crash Protection standard but they can be used in crash tests to show how a restraint system works at the extremes of population.

^bA head injury criteria of 1,000; a chest criteria of 60 G's; and a thigh load of 2,250 lbs. indicate approximate thresholds above which more serious injury could occur. The head injury criteria is the result of a mathematical equation which measures the acceleration of the head over the time of the crash. The chest criteria measures the peak acceleration of the chest during a crash in units of gravity (G's). The thigh load measures the amount of force transmitted through the femur (thigh) during a crash in units of pounds.

^cSled tests were conducted during October and November 1983 by NHTSA's Vehicle Research and Test Center, East Liberty, Ohio. The sleds are mockups of the cars that were to be retrofitted with the air bag kit. For test 1, the air bag was unvented, i.e., no openings to allow the inflation gas to escape; for test 2, the air bag had 40 mm vents, and for test 5, the air bag had 20 mm vents. All other air bags had 25 mm vents. The sled tests were head-on into a flat concrete barrier except test 17 and 18 where the sled was at a 15 degree angle to the barrier. Test 19 was done with a Hybrid III anthropomorphic dummy which was developed by GM as an alternative to the dummy required under DOT's Occupant Crash Protection standard.

^dAccording to the president of Romeo-Kojyo, Inc., the company which produced the retrofit kits, the air bag did not deploy because of an incorrect mechanical and electrical connection to the gas generator. He stated that the diagnostic module which measures whether the system is activated has been modified to determine whether the gas generator is correctly connected and that this modification will prevent the situation from reoccurring.

^eNHTSA contracted with Dynamic Science, Inc., a private company that conducts vehicle testing for industry and government, to conduct the car crash tests at its Phoenix, Arizona, test facility.

24250

AN EQUAL OPPORTUNITY EMPLOYER

**UNITED STATES
GENERAL ACCOUNTING OFFICE
WASHINGTON, D.C. 20548**

**OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE \$300**

**POSTAGE AND FEES PAID
U. S. GENERAL ACCOUNTING OFFICE**



THIRD CLASS